

How Good Is the Quality of Health Care in the United States?

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QUANTITY OF HEALTH CARE IS ON THE NATIONAL agenda. In September 1996, President Clinton established the Advisory Commission on Consumer Protection and Quality in the Health Care Industry, which has released its final report on how to define, measure, and promote quality of health care (President's Advisory Commission on Consumer Protection and Quality in the Health Care Industry 1998).

Much of the interest in quality of care has developed in response to the dramatic transformation of the health care system in recent years. New organizational structures and reimbursement strategies have created incentives that may affect quality of care. Although some of the systems are likely to improve quality, concerns about potentially negative consequences have prompted a movement to assure that quality will not be sacrificed to control costs.

The concern about quality arises more from fear and anecdote than from facts; there is little systematic evidence about quality of care in the United States. We have no mandatory national system and few local systems to track the quality of care delivered to the American people. More information is available on the quality of airlines, restaurants, cars, and VCRs than on the quality of health care.

We have conducted a review of the academic literature for articles on quality of care in the United States, and we summarize our findings

The Milbank Quarterly, Vol. 83, No. 4, 2005 (pp. 843–95)

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Reprinted from The Milbank Quarterly, Vol. 76, No. 4, 1998 (pp. 517–63). Style and usage are unchanged.

in this article. In the absence of a national quality tracking system, we believe such a summary is the best way to provide an overview of the quality of care delivered in the United States. We provide examples to illustrate quality in diverse settings, for diverse conditions, and for diverse demographic groups, and to offer insight into the quality that exists nationwide.

Methods

Definitions

The Institute of Medicine has defined *quality* as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge” (Lohr 1990). Good quality means providing patients with appropriate services in a technically competent manner, with good communication, shared decision making, and cultural sensitivity. In practical terms, poor quality can mean *too much care* (e.g., providing unnecessary tests, medications, and procedures, with associated risks and side effects), *too little care* (e.g., not providing an indicated diagnostic test or a life-saving surgical procedure), or the *wrong care* (e.g., prescribing medicines that should not be given together, using poor surgical technique).

Quality can be evaluated based on structure, process, and outcomes (Donabedian 1980). *Structural quality* evaluates health system characteristics, *process quality* assesses interactions between clinicians and patients, and *outcomes* offer evidence about changes in patients’ health status. All three dimensions can provide valuable information for measuring quality, but the published quality-of-care literature reveals that there is more experience with measuring processes of care. Two particular techniques, which measure a type of process quality called “technical process quality,” dominate the literature.

Technical process quality refers to whether care is provided skillfully and whether the right choices are made in diagnosing and treating the patient. The latter (making the correct choices) is generally measured by assessing appropriateness or adherence to professional standards.

An intervention or service (e.g., a lab test, procedure, medication) is considered *appropriate* if, for individuals with particular clinical and personal characteristics, its expected health benefits (e.g., increased life

expectancy, pain relief, decreased anxiety, improved functional capacity) exceed its expected health risks (e.g., mortality, morbidity, anxiety anticipating the intervention, pain caused by the intervention, inaccurate diagnoses) by a wide enough margin to make the intervention or service worth doing (Brook et al. 1986). A subset of appropriate care is *necessary* or crucial care. Care is considered necessary if there is a reasonable chance of a nontrivial benefit to the patient and if it would be improper not to provide the care. In other words, it might be considered ethically unacceptable not to provide this care (Kahan et al. 1994; Laouri et al. 1997). Appropriateness criteria and necessity criteria can be used, respectively, to measure *overuse* of care, which is a problem because of treatment complications and wasted resources, and *underuse* of care, which means that people are not getting care expected to improve their health.

Another way to measure process quality is to determine whether care meets professional standards. This assessment can be done by creating a list of *quality indicators* that describe a process of care that should occur for a particular type of patient or clinical circumstance and then evaluating whether patients' care is consistent with the indicators. Quality indicators are based on standards of care, which are either found in the research literature and in statements of professional medical organizations or determined by an expert panel. Current performance can be compared against a physician's or plan's own prior performance, against the performance of other physicians and plans, or with reference to a benchmark that establishes a goal. Indicators can cover a specific condition (e.g., children with sickle cell disease should be prescribed daily penicillin prophylaxis from at least six months of age until at least five years of age), or they can cover general aspects of care regardless of condition (e.g., patients prescribed a medication should be asked about medication allergies).

Literature Review

Our review is based on a search of articles in the National Library of Medicine's Medline Plus system (1993 to present) conducted in June 1997 and on studies identified from the bibliographies of these articles. We excluded articles published before 1987. We did not aim to be exhaustive but, rather, to find examples that cover a broad range of conditions and settings. We report data only from large or diverse

populations, such as the nation, an entire state, an entire city, or several hospitals. We do not include data from studies that covered only a single hospital or clinic.

Categorization

Our review of quality in the United States is divided into three categories based on type of care: preventive (Table 1), acute (Table 2), and chronic (Table 3). We have chosen this categorization because there are differences in the way these types of care are delivered that could affect quality. Preventive care is typically initiated on a routine basis by the clinician rather than on an episodic basis by a patient coming to the clinician with symptoms, and it is generally not covered as well by insurance. The need for acute care is typically identified by the patient, and the care is often delivered during a single encounter. Chronic care is more likely than acute care to be delivered by a clinician who has an ongoing relationship with the patient, and good chronic care is also more likely to involve good follow-up. The tables describe the health care service for which quality is reported, the sample on which the report is based, the data source for the sample, the findings, and the reference for the findings. We report on data from 48 articles covering about one-half million people.

Quality of Care in the United States

Perhaps the most striking revelation to emerge from this review is the surprisingly small amount of systematic knowledge available on the quality of health care delivered in the United States. Even though health care is a huge industry that affects the lives of most Americans, we have only snapshots of information about particular conditions, types of surgery, and locations of care.

The dominant finding of our review is that there are large gaps between the care people should receive and the care they do receive. This is true for all three types of care—preventive, acute, and chronic—whether one goes for a check-up, a sore throat, or diabetic care. It is true whether one looks at overuse or underuse. It is true in different types of health care facilities and for different types of health insurance. It is true for all age groups, from children to the elderly. And it is true whether one is looking at the whole country or a single city.

TABLE 1
Examples of Quality of Preventive Health Care in the United States

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
IMMUNIZATIONS				
<i>Routine childhood vaccines (1995 schedule)</i>				
3 Polio; 4 Diphtheria, Tetanus, Pertussis; 1 Measles, Mumps, Rubella; and 3 Haemophilus influenzae type b (Hib) by 18 months old. (3–4 doses of Hib are recommended, depending on formulation; 3 Hepatitis B virus vaccines [HBV] are also recommended but were not included in this particular study.) (American Academy of Pediatrics 1994; CDC 1995a).	Children 19–35 months old in 31,997 households from a nationally representative sample of the U.S.	National Immunization Survey (NIS), 1995	74% received all the vaccines. (If 3 doses of Hib are not included, the percentage is 76%.)	(CDC 1997)
<i>Influenza vaccine (adult)</i>	Annual vaccination of all people ≥65 years old is recommended (U.S. Preventive Services Task Force 1989). This recommendation has since been reiterated (U.S. Preventive Services Task Force 1996).	National Health Interview Survey (NHIS), 1993	52% received annual influenza vaccine.	(CDC 1995b)

(Continued)

TABLE 1—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Pneumococcal vaccine (adult)</i>				
One-time vaccination for all people ≥ 65 years old is recommended (U.S. Preventive Services Task Force 1989). In 1996, the recommendation was modified to specify one-time vaccination for all immunocompetent individuals ≥ 65 years old (U.S. Preventive Services Task Force 1996).	Same as above	Same as above	28% received pneumococcal vaccine.	(CDC 1995b)
CANCER SCREENING				
<i>Breast cancer: clinical breast examination (CBE) and mammography</i>				
Recommendations vary. In 1989, the USPSTF recommended an annual CBE for women ≥ 40 years old and mammography every 1–2 years for women 50–75 years old (U.S. Preventive Services Task Force 1989). In 1996, it recommended mammography every 1–2 years with or without annual CBE for women 50–69 years old (U.S. Preventive Services Task Force 1996).	21,601 women ≥ 50 years old from a sample of people representative of the U.S. (excluding Arkansas and Wyoming, and including the District of Columbia)	Behavioral Risk Factor Surveillance System, 1992	58% had CBE in the prior year; 46% had mammography in the prior year; 40% had both examinations in the prior year.	(CDC 1993a)

<p><i>Cervical cancer: Papanicolaou (Pap) smear</i> Women with an intact uterus (have a cervix) should have a Pap smear after initiation of sexual intercourse and every 1–3 years thereafter. Some organizations recommend starting Pap smears for all women who have reached 18 years old, regardless of sexual history (U.S. Preventive Services Task Force 1989). These recommendations have since been reiterated (U.S. Preventive Services Task Force 1996).</p>	<p>Women \geq 18 years old with an intact uterus from a sample of 128,412 people representative of the U.S. civilian, noninstitutionalized population</p>	<p>NHIS, 1992</p>	<p>67% had a Pap smear in the prior 3 years.</p>	<p>(CDC 1995c)</p>
<p><i>Colon cancer: fecal occult blood testing (FOBT) and sigmoidoscopy</i> Recommendations vary. In 1980, the American Cancer Society recommended annual FOBT starting at 50 years old. Some other organizations made similar recommendations. In 1989, the USPSTF did not make recommendations (U.S. Preventive Services Task Force 1989), but in 1996, it recommended annual FOBT, sigmoidoscopy (periodicity unspecified), or both starting at 50 years old (U.S. Preventive Services Task Force 1996).</p>	<p>Adults \geq 40 years old from a sample of 128,412 people representative of the U.S. civilian, noninstitutionalized population</p>	<p>Same as above</p>	<p>14% of men and 15% of women had FOBT in the prior year; 44% of men and 43% of women had ever had FOBT; 11% of men and 7% of women had sigmoidoscopy in the prior 3 years.</p>	<p>(CDC 1995c)</p>

(Continued)

TABLE 1—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Colon cancer: FOBT and sigmoidoscopy</i>				
Same as above	250 women 40–65 years old who had no major illnesses, who received primary care at one of the group practices, and who were eligible for preventive care	Medical records for patients from 4 group practices in Massachusetts, 11/1/85–10/31/87	51%–59% of women had FOBT every 2 years or flexible sigmoidoscopy every 5 years.	(Udvarhelyi et al. 1991)
CARDIAC RISK FACTORS				
<i>Smoking cessation counseling</i>				
Tobacco cessation counseling should be offered on a regular basis to all patients who smoke cigarettes, pipes, or cigars, and to those who use smokeless tobacco (U.S. Preventive Services Task Force 1989). This recommendation has since been reiterated (U.S. Preventive Services Task Force 1996).	8,778 smokers ≥ 18 years old from a sample of 43,732 people representative of the U.S. civilian, noninstitutionalized population	NHIS, 1991	37% of smokers who had a visit with a physician or other health-care professional during the prior year had been advised to quit smoking.	(CDC 1993b)

<p><i>Blood cholesterol testing</i></p>	<p>In 1988, the National Heart, Lung, and Blood Institute recommended routine cholesterol screening at least every 5 years starting at 20 years old. In 1989, the USPSTF recommended periodic screening for middle-aged men (U.S. Preventive Services Task Force 1989), and in 1996, it recommended periodic screening for men 35–65 years old and women 45–65 years old (U.S. Preventive Services Task Force 1996).</p>	<p>3,700 adults \geq 18 years old from a representative sample of the non-African American U.S. population</p>	<p>Telephone survey by the National Heart, Lung, and Blood Institute, 1990</p>	<p>65% of adults surveyed in 1990 had ever had a blood cholesterol test; 51% had the test in the prior year; and an additional 14% had it prior to that. 35% had never had a blood cholesterol test.</p>	<p>(Schucker et al. 1991)</p>
<p><i>Blood cholesterol testing</i></p>	<p>Same as above</p>	<p>Adults \geq 20 years old from a sample of people representative of the U.S. (excluding Wyoming, Kansas, and Nevada, and including the District of Columbia) (sample sizes for individual states range from 670 to 3,190 people)</p>	<p>CDC's Behavioral Risk Factor Surveillance System data, 1991</p>	<p>The state-specific rates of adults in 1991 who had cholesterol screening in the prior 5 years ranged from 57%–70%.</p>	<p>(CDC 1993c)</p>

(Continued)

TABLE 1—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
GENERAL PREVENTIVE CARE				
<i>Well-child care</i>				
The American Academy of Pediatrics recommends routine history, physical examination, screening tests, and anticipatory guidance throughout childhood (American Academy of Pediatrics 1988).	All children who had their second birthday during the first half of the study year, and all 2-year-olds with otitis media or asthma, from a sample of 2,024 patients of 135 providers	Medical records from physicians' offices, community health centers, and hospital outpatient facilities sampled from Maryland Medicaid claims data, 1988	For each type of clinical setting, the study reports the average percentage of technical quality indicators for well-child care that were not met. Each average was located in the 35%–65% range.	(Starfield et al. 1994)
<i>Well-adult care</i>				
Patients should have preventive health visits every 1–3 years when 19–64 years old and every year when ≥65 years old (U.S. Preventive Services Task Force 1989).	All adults with asthma, hypertension, and diabetes from a sample of 2,024 patients of 135 providers	Same as above	For each type of clinical setting, the study reports the average percentage of technical quality indicators for well-adult care that were not met. Each average was located in the 45%–55% range.	(Starfield et al. 1994)

^aIf a description in the first column has no citation, it is covered by the citation in the reference column.^bWe contacted the authors of some of the articles to clarify details related to the sample and to the data analysis.

TABLE 2
Examples of Quality of Acute Health Care in the United States

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
ANTIBIOTIC USE <i>Common cold</i> Almost all colds are caused by a virus, for which antibiotics are not an effective treatment.	1,439 patients with 2,171 outpatient and emergency department visits for the common cold (acute nasopharyngitis) from a random sample of 50,000 patients with at least 1 claim for care by a physician, dentist or optometrist	Kentucky Medicaid claims data, 7/1/93–6/30/94	In 60% of encounters for the common cold, patients filled prescriptions for antibiotics.	(Mainous et al. 1996)
<i>Upper respiratory tract infection</i> Antimicrobial drugs do not shorten the course of viral upper respiratory tract infection nor do they prevent secondary bacterial infections.	Nationally representative sample of 3,000 office-based physicians	National Ambulatory Medical Care Survey (NAMCS), 1992	16% of all antimicrobial drug prescriptions (an estimated 17,922,000 prescriptions nationally) were written for upper respiratory tract infections in 1992.	(McCaig and Hughes 1995)

(Continued)

TABLE 2—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Pharyngitis, nasal congestion, common cold, and other upper respiratory tract infection</i>				
Since most of these conditions are viral, antibiotics have no benefit.	Same as above	Same as above	Over 70% of patients received antibiotic prescriptions for pharyngitis (excluding streptococcal), over 50% received them for rhinitis, and over 30% received them for a nonspecific upper respiratory tract infection, cough, or cold.	(Dowell and Schwartz 1997)
RESPIRATORY ILLNESS <i>Pneumonia: hospital care</i>				
Care for pneumonia	1,408 patients hospitalized with pneumonia from a nationally representative sample of 7,156 patients hospitalized with any of 5 conditions (congestive heart failure, acute myocardial infarction, pneumonia, stroke, hip fracture) (Draper et al. 1990)	Medical records for Medicare patients from 297 hospitals in 5 states (California, Florida, Indiana, Pennsylvania, Texas), 7/1/85–6/30/86	52%–90% of patients with pneumonia received appropriate components of care (e.g., documentation of tobacco use/nonuse and lower-extremity edema; blood pressure readings; oxygen therapy or intubation for hypoxic patients).	(Kahn et al. 1990)

<p><i>Pneumonia</i> Hospital admissions for pneumonia are considered appropriate when, for example, a patient fails to improve with outpatient oral medication or has a pleural effusion or an empyema.</p>	<p>445 hospital admissions of children <18 years old admitted with pneumonia</p>	<p>Medical records for patients from 12 hospitals in 5 communities in Boston and nearby suburbs, 7/1/85–6/30/86</p>	<p>9.4% of admissions were inappropriate.</p>	<p>(Payne et al. 1995)</p>
<p><i>Bronchitis/asthma</i> Hospital admissions for bronchitis/asthma are considered appropriate when, for example, a patient has failed to improve with outpatient therapy or has a pneumothorax.</p>	<p>1,038 hospital admissions of children <18 years old admitted with bronchitis/asthma</p>	<p>Same as above</p>	<p>4.4% of admissions were inappropriate.</p>	<p>(Payne et al. 1995)</p>
<p>OTTIS MEDIA <i>Treatment</i></p>	<p>464 children \leq 3 years old diagnosed with otitis media from a sample of 2,024 patients of 135 providers</p>	<p>Medical records from physicians' offices, community health centers, and hospital outpatient facilities sampled from Maryland Medicaid claims data, 1988</p>	<p>For each type of clinical setting, the study reports the average percentage of technical quality indicators for otitis media that were not met. Each average was located in the 10%–40% range.</p>	<p>(Starfield et al. 1994)</p>

(Continued)

TABLE 2—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Use of tympanostomy tubes</i>				
Indications for tympanostomy tube placement include refractory middle ear infection and chronic mastoiditis.	6,429 children <16 years old with recurrent acute otitis media and/or persistent otitis media with effusion who were insured in health plans requiring precertification by a utilization review firm	Interviews with physicians' office staff at otolaryngology practices from 49 states and the District of Columbia, 1/1/90–7/30/91; additional interviews were conducted with otolaryngologists to determine the existence of extenuating clinical circumstances	41% of tube insertions were appropriate, 32% equivocal, and 27% inappropriate. If extenuating clinical circumstances were taken into account, 42% of tube insertions were appropriate, 35% equivocal, and 23% inappropriate.	(Kleinman et al. 1994)
HIP FRACTURES <i>Hip fracture: hospital care</i>				
Care for hip fracture	1,404 patients hospitalized with hip fracture from a nationally representative sample of 7,156 patients hospitalized with any of 5 conditions (congestive heart failure, acute myocardial infarction, pneumonia, stroke, hip fracture) (Draper et al. 1990)	Medical records for Medicare patients from 297 hospitals in 5 states (California, Florida, Indiana, Pennsylvania, Texas), 7/1/85–6/30/86	67%–94% of patients with hip fracture received appropriate components of care (e.g., documentation of mental status and pedal or leg pulse; serum potassium level; electrocardiogram).	(Kahn et al. 1990)

PRENATAL CARE
Medical history

9,924 women who had live births in 1988 from a nationally representative sample of the U.S. (excluding South Dakota and Montana, and including the District of Columbia)

80% were asked about health history during the first or second visit.

(Kogan et al. 1994)

National Maternal and Infant Health Survey (NMIHS), 1988

Physical examination

Same as above

98% had their weight and height measured, 96% had blood pressure measured, and 86% received a physical or pelvic examination during the first or second visit.

(Kogan et al. 1994)

Same as above

Laboratory tests (hemoglobin blood test and urine test)

Same as above

79% received blood tests and 93% received urinalysis during the first or second visit.

(Kogan et al. 1994)

Same as above

Medical history, physical examination, and laboratory tests

Same as above

56% received all of the evaluations listed above during the first or second visit.

(Kogan et al. 1994)

Same as above

(Continued)

TABLE 2—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Counseling about nutrition and weight gain</i>	Same as above	Same as above	97% were counseled about vitamins, 93% were counseled about diet, and 72% were counseled about proper weight gain during pregnancy, during at least one prenatal visit.	(Kogan et al. 1994)
<i>Counseling about alcohol, tobacco, and illicit drugs</i>	Same as above	Same as above	68% were counseled to reduce or eliminate alcohol consumption, 69% to reduce or eliminate smoking, and 65% to stop use of illegal drugs, during at least one prenatal visit.	(Kogan et al. 1994)
<i>Counseling about breastfeeding</i>	Same as above	Same as above	53% were counseled about breastfeeding during at least one prenatal visit.	(Kogan et al. 1994)
<i>Counseling about nutrition, weight gain, alcohol, tobacco, illicit drugs, and breastfeeding</i>	Same as above	Same as above	32% received all of the counseling listed above during at least one prenatal visit.	(Kogan et al. 1994)

<p><i>Routine prenatal screening tests</i> (i.e., tests to screen for anemia, asymptomatic bacteriuria, syphilis, gonorrhea, hepatitis B, rubella immunity, and Rh factor and antibody)</p>	<p>Random sample of 586 women who had a live birth from 24,170 births that occurred during the study period</p>	<p>Medical records for patients from 6 HMOs in 6 states (Arizona, California, Colorado, Massachusetts, Minnesota, Oregon), 8/1/89–7/31/90</p>	<p>Among 6 HMOs, women received 64%–95% (average 82%) of 7 recommended routine prenatal screening tests.</p>	<p>(Murata et al. 1994)</p>
<p><i>Other routine prenatal care</i> (i.e., first prenatal visit during first trimester, accurate determination of gestational age, screening for inherited disorders, measurement of symphysis-fundal height, and blood pressure measurement)</p> <p><i>Care for complications of pregnancy</i> (e.g., diagnostic and treatment interventions after abnormal screening test results, and care to mitigate effects of pregnancy-induced hypertension and gestational diabetes)</p> <p><i>Screening and follow-up for proteinuria (protein in urine)</i></p>	<p>Same as above</p>	<p>Same as above</p>	<p>Among 6 HMOs, women received 78%–87% (average 84%) of 5 processes of routine prenatal care.</p>	<p>(Murata et al. 1994)</p>
<p>Urine is checked for protein to evaluate for the presence of preeclampsia, a serious complication of pregnancy.</p>	<p>Inpatient records for 2,336 women from a sample of 2,878 births in 1985; prenatal care records for 823 of these women</p>	<p>Medical records for patients sampled from Medicaid claims files for women and children enrolled in Aid to Families with Dependent Children</p>	<p>Among 6 HMOs, women received 54%–77% (average 70%) of processes of care for complications of pregnancy.</p>	<p>(Murata et al. 1994)</p>
<p>Urine is checked for protein to evaluate for the presence of preeclampsia, a serious complication of pregnancy.</p>	<p>Medical records for patients</p>	<p>Testing was provided at 75%–83% of visits. Follow-up was performed for 41%–65% of patients with proteinuria.</p>	<p>(Carey et al. 1991)</p>	<p>(Continued)</p>

TABLE 2—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Screening and follow-up for proteinuria (protein in urine)</i> (continued)		(AFDC) in 2 communities in California and 2 communities in Missouri, 1985		
<i>Recording of gestational age</i>	Same as above	Same as above	Gestational age was recorded at 78%–95% of visits.	(Carey et al. 1991)
<i>Assessment of fetal heart tones after 18 weeks of gestation</i>	Same as above	Same as above	Fetal heart tones were assessed at 81%–93% of visits.	(Carey et al. 1991)
<i>Follow-up for low hematocrit</i> Low hematocrit indicates anemia.	Same as above	Same as above	Follow-up was performed for 32%–51% of patients with low hematocrit.	(Carey et al. 1991)
<i>Follow-up for high blood pressure</i>	Same as above	Same as above	Follow-up was performed for 31%–53% of patients with high blood pressure.	(Carey et al. 1991)

^aIf a description in the first column has no citation, it is covered by the citation in the reference column.

^bWe contacted the authors of some of the articles to clarify details related to the sample and to the data analysis.

TABLE 3
Examples of Quality of Chronic Health Care in the United States

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
ASTHMA <i>Adult asthma</i>	Adults ≥ 18 years old in a group of 393 adults and children diagnosed with asthma, from a sample of 2,024 patients of 135 providers	Medical records from physicians' offices, community health centers, and hospital outpatient facilities sampled from Maryland Medicaid claims data, 1988	For each type of clinical setting, the study reports the average percentage of technical quality indicators for adult asthma that were not met. Each of the averages was located in the 40%–45% range. Between 5% and 35% of care was inappropriate.	(Starfield et al. 1994)
<i>Childhood asthma</i>	Children < 18 years old in a group of 393 adults and children diagnosed with asthma, from a sample of 2,024 patients of 135 providers	Same as above	For each type of clinical setting, the study reports the average percentage of technical quality indicators for childhood asthma that were not met. Each of the averages was located in the 30%–40% range. Between 0% and 20% of care was inappropriate.	(Starfield et al. 1994)

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
DIABETES MELLITUS				
<i>Dilated eye examination to screen for retinopathy</i>				
Annual dilated eye examination starting at time of diagnosis of non-insulin-dependent diabetes mellitus (NIDDM) and 5 years after diagnosis of insulin-dependent diabetes mellitus (IDDM).	2,392 adults ≥ 18 years old with IDDM (124 patients), NIDDM treated with insulin (922 patients), and NIDDM not treated with insulin (1,346 patients) from a sample of 84,572 people representative of the U.S. civilian, noninstitutionalized population	National Health Interview Survey, 1989	49% had a dilated eye examination in the prior year; 66% had an examination in the prior 2 years; 61% and 57% of patients at high risk of vision loss because of a history of retinopathy or of long duration of diabetes, respectively, had an examination in the prior year.	(Brechtner et al. 1993)
<i>Any eye examination (including nondilated) to screen for retinopathy</i>	Same as above	Same as above	61% had an eye examination in the prior year; 79% had an examination in the prior 2 years.	(Brechtner et al. 1993)
Dilated eye examination is recommended, as described above, but any eye examination is also reported to determine whether there was any effort to assess for retinopathy.	Same as above	Same as above		

<p><i>Eye exam by ophthalmologist</i> Dilated eye examination is recommended, as described above, but an examination by an ophthalmologist serves as a proxy for a dilated eye examination.</p>	<p>97,388 Medicare patients ≥ 65 years old diagnosed with diabetes mellitus</p>	<p>All Medicare claims data (Parts A and B) from 3 states (Alabama, Iowa, Maryland), submitted from 7/1/90–6/30/91</p>	<p>54% did not have an examination by an ophthalmologist during the prior year.</p>	<p>(Weiner et al. 1995)</p>
<p><i>Hemoglobin A1C</i> Hemoglobin A1C (or glycosylated hemoglobin) is a blood test that reflects the metabolic control of diabetes. The test should be performed at least once a year for diabetics.</p>	<p>Same as above</p>	<p>Same as above</p>	<p>84% did not receive a hemoglobin A1C test during the prior year.</p>	<p>(Weiner et al. 1995)</p>
<p><i>Cholesterol screening</i> It is recommended that total cholesterol should be measured at least once a year for diabetics.</p>	<p>97,388 Medicare patients ≥ 65 years old diagnosed with diabetes mellitus</p>	<p>All Medicare claims data (Parts A and B) from 3 states (Alabama, Iowa, Maryland), submitted from 7/1/90–6/30/91</p>	<p>45% did not receive blood cholesterol screening during the prior year.</p>	<p>(Weiner et al. 1995)</p>
<p><i>Diabetes mellitus</i></p>	<p>368 adults ≥ 18 years old diagnosed with diabetes, from a sample of 2,024 patients of 135 providers</p>	<p>Medical records from physician offices, community health centers, and hospital outpatient facilities sampled from Maryland Medicaid claims data, 1988</p>	<p>For each clinical setting, the study reports the average percentage of technical quality indicators for diabetes that were not met. Each average was located in the 40%–60% range.</p>	<p>(Starfield et al. 1994)</p>

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
HYPERTENSION				
<i>Treatment for hypertension</i>				
Hypertension (or high blood pressure) is a leading risk factor for coronary heart disease, congestive heart failure, stroke, ruptured aortic aneurysm, renal disease, and retinopathy, all of which contribute to high morbidity and mortality (U.S. Preventive Services Task Force 1989). This was reiterated in 1996 (U.S. Preventive Services Task Force 1996).	246 patients >30 years old with chronic uncomplicated hypertension	Medical records for patients from 4 group practices in Massachusetts, 11/1/85–10/31/87	41%–54% of patients had their hypertension controlled (mean blood pressure <150/90).	(Udvarhelyi et al. 1991)
<i>Treatment for hypertension</i>				
Same as above	Nationally representative sample of U.S. adults with hypertension (sample size not available)	National Health and Nutrition Examination Survey III, 1988–91	55% of people with hypertension had blood pressure under control (blood pressure <160/95 on one occasion and reported currently taking antihypertensive medications); 21% when using strict criteria (blood pressure <140/90 and reported currently taking antihypertensive medications).	(Joint National Committee on Detection 1993)

Treatment for hypertension

Same as above

8,697 adults ≥ 18 years old diagnosed with hypertension from a sample of 36,610 people representative of the U.S.

NHIS, 1990

(CDC 1994b)

89% of adults with hypertension received advice from a physician about controlling hypertension (i.e., taking antihypertensive medication, decreasing salt intake, losing weight, or exercising); 80% reported taking at least one action to control hypertension.

Treatment for hypertension

Same as above

593 adults ≥ 18 years old diagnosed with hypertension, from a sample of 2,024 patients of 135 providers

Medical records from physician offices, community health centers, and hospital outpatient facilities sampled from Maryland Medicaid claims data, 1988

(Starfield et al. 1994)

For each type of clinical setting, the study reports the average percentage of technical quality indicators for hypertension that were not met. Each average was located in the 40%–55% range.

DEPRESSION

Depression: treatment

There is no evidence that minor tranquilizers are effective for depression, but there is evidence that antidepressant medications are effective for depression.

634 patients with current depressive disorder or depressive symptoms from a sample of 22,399 adult patients who visited 1 large HMO and several multispecialty, mixed-group practices in each city during the study period

Medical Outcomes Study in 3 cities (Boston, Chicago, Los Angeles); questionnaires completed 2/86–10/86; phone interviews completed 5/86–12/86

(Wells et al. 1994a)

19% of patients were treated with minor tranquilizers; 12% were treated with antidepressant medications; 11% were treated with a combination of minor tranquilizers and antidepressant medications; 59% received neither.

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Depression: treatment</i> Same as above	1,198 patients hospitalized with depression, representative of all Medicare elderly patients hospitalized in general medical hospitals with a discharge diagnosis of depression	Medical records for Medicare patients from 297 hospitals in 5 states (California, Florida, Indiana, Pennsylvania, Texas), 7/1/85–6/30/86	33% of patients discharged with antidepressants had doses below recommended level.	(Wells et al. 1994b)
<i>Depression: admission</i> Appropriate reasons for admission include depression, medical condition meriting acute care, comorbid major psychiatric disorder, or medical reasons precluding outpatient care for depression.	Same as above	Same as above	93% were admitted for clearly or possibly appropriate reasons, and 7% were admitted for inappropriate reasons.	(Wells et al. 1993)

Depression: admission assessment

Same as above	Same as above	(Wells et al. 1993)
	As part of admission assessment, 23% of patients did not have adequate psychological assessment, 26% did not have cognitive assessment, 50% did not have assessment of psychosis, 19% did not have documentation of psychiatric history, 47% did not document whether patient had a history of suicide attempts or ideation, 24% did not have documentation of prior or current medication use, and 45% did not have documentation that heart sounds were examined.	
	Mean number of components of neurologic examination (assessments of pupils, deep tendon reflexes and gait) performed was 1.4.	

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Depression: diagnosis and treatment</i>	64 patients with major depression from a sample of 2,592 consecutive primary care patients 18–65 years old who attended one of the study clinics	Patient surveys and interviews, physician surveys, and computerized pharmacy records from 3 primary care clinics of Group Health Cooperative of Puget Sound in Washington	Among patients with major depression who received antidepressant medications, 78% received dosages within the recommended ranges.	(Simon and VonKorff 1995)
MENTAL/ADDICTIVE DISORDER <i>Mental or addictive disorder</i>	People with mental or addictive disorder from a sample of 20,291 adults ≥18 years old	National Institute of Mental Health's Epidemiologic Catchment Area study interviews, 1980–85	29% of people with any mental or addictive disorder received some professional or voluntary mental health service during the prior 12 months, as did 32% of people with any disorder except substance use, 37% of people with any mental disorder with comorbid substance use, 24% of people with substance use (e.g., alcohol), 64% of people with schizophrenia, 46% of people with any	(Regier et al. 1993)

<p>HYSTERECTOMY <i>Hysterectomy</i> Hysterectomy is the surgical removal of the uterus.</p>	<p>642 women ≥ 20 years old who underwent nonemergency, nononcologic hysterectomies</p>	<p>Medical records for patients from 7 managed care organizations, 8/1/89–7/31/90</p>	<p>16% of hysterectomies were inappropriate, 25% were equivocal, and 58% were appropriate.</p> <p>(Bernstein et al. 1993b)</p>
<p>BREAST CANCER <i>Breast cancer: treatment</i></p>	<p>199 women 50–69 years old and 175 women ≥ 70 years old, with adenocarcinoma of the breast, receiving primary cancer management at a participating hospital</p>	<p>Medical records from 7 hospitals in southern California, for women with breast cancer diagnosed in 1980–82</p>	<p>67% of women ≥ 70 years old received appropriate treatment, compared with 83% of women 50–69 years old. When controlling for comorbidity, hospital, and cancer stage, a difference in appropriateness related to age persisted.</p> <p>(Greenfield et al. 1987)</p>

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
CARDIAC DISEASE				
<i>Coronary artery disease: coronary angiography</i>				
Coronary angiography is a method for evaluating coronary artery anatomy to determine whether a patient is a candidate for coronary artery bypass graft surgery or percutaneous transluminal coronary angioplasty.	352 patients who met explicitly defined criteria for necessity of coronary angiography, from among 1,350 positive exercise stress tests in a randomly selected sample of 5,850 stress tests	Medical records from 4 teaching hospitals (3 public, 1 private) in Los Angeles, and patient telephone interviews (with 243 of the 352 patients), 1/1/90–6/30/91	43% of patients received coronary angiography within 3 months of the positive exercise stress test; 56% received coronary angiography within 12 months of the positive test.	(Laouri et al. 1997)
<i>Coronary artery disease: coronary angiography</i>				
Same as above	Random sample of 1,335 patients who had coronary angiography	Medical records from 15 nonfederal hospitals providing coronary angiography in New York, selected through a stratified random sample (for location, volume of coronary angiography, and authorization to perform coronary artery bypass graft surgery), 1990	4% of coronary angiographies were inappropriate, 20% were equivocal, and 76% were appropriate.	(Bernstein et al. 1993a)

<p><i>Coronary artery disease: coronary angiography</i> Same as above</p>	<p>Random sample of 1,677 cases of coronary angiography</p> <p>Medicare physician claims data and medical records from 3 sites selected from 13 sites in 8 states (Arizona, California, Colorado, Iowa, Massachusetts, Montana, Pennsylvania, South Carolina), 1981</p>	<p>17% of coronary angiographies were inappropriate, 9% were equivocal, and 74% were appropriate.</p>	<p>(Chassin et al. 1987)</p>
<p><i>Coronary artery disease: coronary artery bypass graft (CABG)</i> In CABG surgery, damaged blood vessels supplying the heart are replaced with vessels from elsewhere in the body.</p>	<p>Stratified, random sample of 386 patients who underwent CABG surgery in the 3 hospitals</p> <p>Medical records from 3 hospitals (excluding Veterans Administration or governmental hospitals and specialty hospitals) selected through a stratified random sample (for size and teaching status) in a western state as part of the National Institutes of Health Consensus Development Program, 1979, 1980, and 1982</p>	<p>14% of CABG surgeries were inappropriate, 30% were equivocal, and 56% were appropriate.</p>	<p>(Winslow et al. 1988)</p>

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Coronary artery disease: CABG</i>				
Same as above	Random sample of 1,156 patients who had isolated CABG surgery	Medical records for patients from 12 Academic Medical Center Consortium hospitals in 10 states (California, Iowa, Louisiana, Maryland, Massachusetts, Minnesota, New Hampshire, New York, North Carolina, Pennsylvania), 1990	1.6% of CABG surgeries were inappropriate, 7% were equivocal, and 92% were appropriate.	(Leape et al. 1996)
<i>Coronary artery disease: CABG</i>				
Same as above	Random sample of 1,338 patients who had isolated CABG surgery	Medical records from 15 nonfederal hospitals providing CABG procedure in New York, selected through a stratified random sample (for location and volume of CABG operations), 1990	2.4% of CABG surgeries were inappropriate, 7% were equivocal, and 91% were appropriate.	(Leape et al. 1993)
<i>Coronary artery disease: percutaneous transluminal coronary angioplasty (PTCA)</i>				
PTCA uses a miniature balloon catheter to decrease stenosis (blockage) in blood vessels supplying the heart.	Random sample of 1,306 patients who had PTCA	Medical records from 15 nonfederal hospitals providing PTCA in New York, selected through a stratified random sample (for location and volume of PTCA), 1990	4% of PTCA were inappropriate, 38% were equivocal, and 58% were appropriate.	(Hilborne et al. 1993)

<p><i>Heart attack: treatment with aspirin</i></p>	<p>Aspirin is an effective, inexpensive, and safe treatment for a heart attack. Aspirin therapy reduces short-term mortality in patients with suspected heart attack by 23%. Aspirin should not be given to patients with certain conditions (e.g., hemorrhagic stroke, gastrointestinal bleeding).</p>	<p>7,917 Medicare patients ≥ 65 years old, hospitalized with heart attack who were "ideal" candidates for treatment with aspirin with no possible contraindications to aspirin therapy</p>	<p>Medical records for Medicare beneficiaries who were hospitalized in 4 states (Alabama, Connecticut, Iowa, Wisconsin), as part of the Cooperative Cardiovascular Project Pilot, 6/1/92–2/28/93</p>	<p>64% received aspirin within the first 2 days of hospitalization.</p>	<p>(Krumholz et al. 1995)</p>
<p><i>Heart attack: treatment with aspirin</i></p>	<p>Same as above</p>	<p>5,490 Medicare patients ≥ 65 years old, hospitalized with heart attack who were alive at discharge and who had no contraindications to aspirin therapy</p>	<p>Some as above</p>	<p>76% were discharged with instructions to take aspirin. Patients who were prescribed aspirin at discharge had a 6-month mortality rate of 8.4%, compared with 17% for patients not prescribed aspirin.</p>	<p>(Krumholz et al. 1996)</p>

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Heart attack: treatment with aspirin</i>				
Same as above	7,486 patients who were "ideal" candidates for treatment with aspirin during initial hospitalization from a sample of 16,124 Medicare patients hospitalized with a principal diagnosis of heart attack; 5,841 patients who were alive at discharge and who were "ideal" candidates for treatment with aspirin prior to or at time of discharge, from the same sample	Same as above	83% received aspirin during hospitalization; 77% received aspirin prior to or at time of discharge.	(Ellerbeck et al. 1995)
<i>Heart attack: treatment with aspirin</i>				
Same as above	187 patients with confirmed heart attack who were alive at discharge and who had no contraindications to aspirin therapy from a sample of 300 Medicare patients ≥ 65 years old hospitalized with a principal diagnosis of heart attack	Medicare mortality data issued by the Health Care Financing Administration (HCFA) and medical records for Medicare patients from 6 hospitals in Connecticut, as part of the Medicare Hospital Information Project, 10/1/88–9/30/91	73% received aspirin at time of discharge.	(Meehan et al. 1995)

<p><i>Heart attack: treatment with thrombolytics</i></p> <p>Thrombolytics are medications that break down some of the acute blockage in the blood vessels that causes a heart attack, thereby reducing infarct size and limiting left ventricular dysfunction. Thrombolytics have been shown to reduce post-AMI mortality by as much as 25%, though they should not be given to patients with certain conditions (e.g., recent hemorrhagic stroke)</p>	<p>1,105 patients who were "ideal" candidates for treatment with thrombolytic agents from a sample of 16,124 Medicare patients hospitalized with a principal diagnosis of heart attack.</p>	<p>Medical records for Medicare beneficiaries who were hospitalized in 4 states (Alabama, Connecticut, Iowa, Wisconsin), as part of the Cooperative Cardiovascular Project Pilot, 6/1/92–2/28/93</p>	<p>70% received thrombolytics during hospitalization.</p>	<p>(Ellerbeck et al. 1995)</p>
<p><i>Heart attack: treatment with thrombolytics</i></p> <p>Same as above</p>	<p>68 patients with confirmed heart attack who had no contraindications to thrombolytic therapy and who had electrocardiographic indications for thrombolytic therapy from a sample of 300 Medicare patients ≥ 65 years old hospitalized with a principal diagnosis of heart attack</p>	<p>Medicare mortality data issued by HCFA and medical records for Medicare patients from 6 hospitals in Connecticut, as part of the Medicare Hospital Information Project, 10/1/88–9/30/91</p>	<p>43% received thrombolytics during hospitalization.</p>	<p>(Meehan et al. 1995)</p>

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Heart attack: treatment with heparin</i>				
Heparin is beneficial to patients with heart attack though heparin should not be given to patients with certain conditions (e.g., bleeding disorders, stroke).	9,857 patients who were "ideal" candidates for treatment with heparin from a sample of 16,124 Medicare patients hospitalized with a principal diagnosis of heart attack	Medical records for Medicare beneficiaries who were hospitalized in 4 states (Alabama, Connecticut, Iowa, Wisconsin), as part of the Cooperative Cardiovascular Project Pilot, 6/1/92–2/28/93	69% received heparin during hospitalization.	(Ellerbeck et al. 1995)
<i>Heart attack: treatment with intravenous nitroglycerin</i>				
Intravenous nitroglycerin is beneficial to patients with heart attack who have persistent chest pain, although intravenous nitroglycerin should not be given to patients with certain conditions (e.g., shock or hypotension on admission).	1,754 patients who were "ideal" candidates for treatment with intravenous nitroglycerin from a sample of 16,124 Medicare patients hospitalized with a principal diagnosis of heart attack	Same as above	74% received intravenous nitroglycerin during hospitalization.	(Ellerbeck et al. 1995)
<i>Heart attack: avoidance of calcium channel blockers for patients with a contraindication</i>				
Calcium channel blockers should not be given to patients with certain conditions (e.g., low left ventricular ejection fraction, evidence of shock or pulmonary edema during hospitalization).	785 patients with clear contraindication to calcium channel blockers from a sample of 16,124 Medicare patients hospitalized with a principal diagnosis of heart attack	Same as above	21% who were ineligible for calcium channel blockers received them.	(Ellerbeck et al. 1995)

<p><i>Heart attack: smoking cessation advice for smokers</i></p> <p>Smokers with coronary artery disease who stop smoking have a better prognosis than those who keep smoking; at the time of heart attack, these smokers are most susceptible to advice about cessation of smoking.</p>	<p>1,691 smokers who were "ideal" candidates for smoking cessation advice from a sample of 16,124 Medicare patients hospitalized with a principal diagnosis of heart attack</p> <p>Same as above</p>	<p>28% received smoking cessation advice prior to or at time of discharge.</p> <p>(Ellerbeck et al. 1995)</p>
<p><i>Heart attack: treatment with angiotensin-converting enzyme (ACE) inhibitors</i></p> <p>ACE inhibitors can reduce post-AMI mortality in patients with left ventricular dysfunction, although ACE inhibitors should not be given to patients with certain conditions (e.g., aortic stenosis).</p>	<p>1,473 patients who were "ideal" candidates for treatment with ACE inhibitors from a sample of 16,124 Medicare patients hospitalized with a principal diagnosis of heart attack</p> <p>Same as above</p>	<p>59% received ACE inhibitors prior to or at time of discharge.</p> <p>(Ellerbeck et al. 1995)</p>
<p><i>Heart attack: beta blocker therapy</i></p> <p>Beta blocker therapy can reduce post-AMI mortality by as much as 25%, although beta blockers should not be given to patients with certain conditions (e.g., low left ventricular ejection fraction, pulmonary edema).</p>	<p>2,976 patients who were "ideal" candidates for treatment with beta blockers from a sample of 16,124 Medicare patients hospitalized with a principal diagnosis of heart attack</p> <p>Same as above</p>	<p>45% received beta blockers prior to or at time of discharge.</p> <p>(Ellerbeck et al. 1995)</p>

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Heart attack: beta blocker therapy</i> Same as above	3,737 Medicare patients ≥ 65 years old with principal diagnosis of heart attack who were eligible for treatment with beta blockers, from a statewide cohort of 5,332 people who had survived a heart attack for at least 30 days and who had prescription drug coverage	New Jersey Medicare hospital admissions and enrollment data, 1986–92; New Jersey Medicaid drug utilization and enrollment files, 1986–91; New Jersey Program of Pharmacy Assistance for the Aged and Disabled drug utilization data, 1986–91	21% received beta blockers within 90 days of discharge; adjusted mortality rate for patients with treatment was 43% less than that of patients without treatment.	(Soumerai et al. 1997)
<i>Heart attack: beta blocker therapy</i> Same as above	104 patients with confirmed heart attack who were alive at discharge and who had no contraindications to beta blockers from a sample of 300 Medicare patients ≥ 65 years old hospitalized with a principal diagnosis of heart attack	Medicare mortality data issued by HCFA and medical records for Medicare patients from 6 hospitals in Connecticut, as part of the Medicare Hospital Information Project, 10/1/88–9/30/91	41% received beta blockers at time of discharge.	(Meehan et al. 1995)
<i>Heart attack: permanent cardiac pacemaker</i> Pacemakers help regularize abnormal heart rates and rhythms.	Medicare patients who underwent a total of 382 pacemaker implantations	Medical records from 6 university teaching hospitals, 11 university-affiliated hospitals, and 13 community hospitals in Philadelphia County, 1/1/83–6/30/83	20% of pacemaker implantations were inappropriate, 36% were equivocal, and 44% were appropriate.	(Greenspan et al. 1988)

Heart attack: hospital care

Care for heart attack

1,437 patients hospitalized with acute myocardial infarction from a nationally representative sample of 7,156 patients hospitalized with any of 5 conditions (congestive heart failure, acute myocardial infarction, pneumonia, stroke, hip fracture) (Draper et al. 1990)

Medical records for Medicare patients from 297 hospitals in 5 states (California, Florida, Indiana, Pennsylvania, Texas), 7/1/85–6/30/86

64%–68% of patients with acute myocardial infarction received appropriate components of care (e.g., documentation of examination of jugular veins and alcoholism or smoking habits).

(Kahn et al. 1990)

Congestive heart failure: hospital care

Care for congestive heart failure

1,465 patients hospitalized with congestive heart failure from a nationally representative sample of 7,156 patients hospitalized with any of 5 conditions (congestive heart failure, acute myocardial infarction, pneumonia, stroke, hip fracture) (Draper et al. 1990)

Same as above

66%–97% of patients with congestive heart failure received appropriate components of care (e.g., documentation of past surgery and lung examination on day 2; blood pressure readings; electrocardiogram; serum potassium level; oxygen therapy or intubation for hypoxic patients).

(Kahn et al. 1990)

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Stroke: hospital care</i> Care for stroke	1,442 patients hospitalized with stroke from a nationally representative sample of 7,156 patients hospitalized with any of 5 conditions (congestive heart failure, acute myocardial infarction, pneumonia, stroke, hip fracture) (Draper et al. 1990)	Same as above	38%–94% of patients with stroke received appropriate components of care (e.g., documentation of previous stroke and gag reflex; blood pressure readings; electrocardiogram; serum potassium level).	(Kahn et al. 1990)
CAROTID ARTERIES <i>Carotid endarterectomy</i>	Random sample of 1,302 cases of carotid endarterectomy	Medicare physician claims data and medical records from 3 sites selected from 13 states (Arizona, California, Colorado, Iowa, Massachusetts, Montana, Pennsylvania, South Carolina), 1981	32% of carotid endarterectomies were inappropriate, 32% were equivocal, and 55% were appropriate.	(Chassin et al. 1987)
procedure that opens up stenotic (blocked) carotid arteries (which supply blood to the brain).				
GASTROINTESTINAL DISEASE <i>Upper gastrointestinal tract endoscopy</i>	Random sample of 1,585 cases of upper gastrointestinal tract endoscopy	Same as above	17% of upper gastrointestinal tract endoscopies were inappropriate, 11% were equivocal, and 72% were appropriate.	(Chassin et al. 1987)
Endoscopy enables visualization of the gastrointestinal tract, and permits biopsy and brush cytologic examination.				

CATARACTS

Cataract surgery

Cataract surgery is a commonly performed surgery in adults ≥ 65 years old. Cataract surgery should not be performed in people with certain conditions (e.g., macular degeneration or diabetic retinopathy).

1,020 patients who underwent a total of 1,159 cataract surgeries

Medical records for patients from 10 academic medical centers, 1990

2% of cataract surgeries were inappropriate, 7% were equivocal, and 91% were appropriate. (Tobacman et al. 1996)

HIV/AIDS

Relation between hospital experience and mortality from AIDS

300 patients diagnosed with acquired immunodeficiency syndrome (AIDS)

Case records of the

Massachusetts AIDS Surveillance Program and billing records from 40 hospitals, medical records for patients from 22 of the 40 hospitals, and data tapes from the Massachusetts Rate Setting Commission, 1/1/87–12/31/88

Patients in low-experience hospitals were 2.16 times more likely to die (2.92 when controlling for characteristics potentially associated with mortality) during an AIDS admission, compared with those in high-experience hospitals.

(Continued)

TABLE 3—Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<i>Relation between physician experience and mortality from AIDS</i>				
125 primary care physicians' clinical experiences treating 403 adult male patients with AIDS		Group Health HIV/AIDS Surveillance Database, Group Health's Utilization Management/Cost Management Information System, and physician personnel records, 1984–94	Patients of physicians with the least experience survived 14 months after AIDS diagnosis compared with 26 months for patients of physicians with the most experience.	(Kirahata et al. 1996)
NEONATAL MORTALITY				
<i>Relation between physician experience and neonatal mortality</i>				
53,229 births classified as likely neonatal intensive care unit (NICU) admissions from a sample of 473,209 births (singletons only) in 1990		California birth certificate and infant death file for all nonfederal hospitals, California Office of Statewide Health Planning and Development (OSHPD) discharge abstracts, California Perinatal Dispatch Centers' neonatal transport data, and OSHPD hospital data, 1990	Infants born in hospitals with an average NICU census ≥ 20 patients per day had lower risk-adjusted mortality than those born in hospitals without an NICU (odds ratio = 0.74; confidence interval = 0.58–0.95; $P = .02$).	(Phibbs et al. 1996)

PREVENTABLE DEATHS
Evaluation of preventable deaths

182 patients who died in hospitals from stroke, pneumonia, or heart attack

Medical records for patients from 12 hospitals, 1985

1.4% of deaths resulted from inadequate diagnosis or treatment and could have been prevented.

(Dubois and Brook 1988)

ADVERSE EVENTS

Adverse events

An adverse event is an injury that is caused by medical management rather than the underlying disease and that prolongs hospitalization, produces a disability at discharge, or both.

30,121 medical records from a weighted sample of 31,429 records of hospitalized patients from a population of 2,671,863 nonpsychiatric discharged patients

51 randomly selected acute care, nonpsychiatric hospitals in New York, 1984

There were 1,133 adverse events and 280 negligent admissions, representing a 3.7% statewide incidence rate of adverse events, and a 1.0% statewide incidence rate of adverse events due to negligence.

(Brennan et al. 1991)

Adverse drug events

Same as above

4,031 adult admissions to a stratified random sample of 11 medical and surgical units in two hospitals.

Medical records and reports of hospital staff for 2 tertiary care hospitals in Boston, 2/93–7/93

There were 1.8 preventable adverse drug events (ADEs) per 100 admissions (adjusted rate), of which 20% were life threatening, 43% were serious, and 37% were significant. There were an additional 5.5 potential ADEs per 100 admissions (adjusted rate).

(Bates et al. 1995)

^aIf a description in the first column has no citation, it is covered by the citation in the reference column.

^bWe contacted the authors of some of the articles to clarify details related to the sample and to the data analysis.

It is difficult to provide a numerical summary of the findings presented in these tables, but we offer some simple averages as a rough summary. However, we must emphasize that these studies cover different populations, time periods, and methodologies, and so the averages only give a ballpark idea of the quality of care people are receiving.

For acute and chronic care studies, data are mostly reported as the percentage of people who received recommended care (care that should have been delivered was delivered) or contraindicated care (care that should not have been delivered was delivered). For the few studies that reported the percentage of people who did not receive recommended care (care that should have been delivered was not delivered), we subtract the value from 100 percent to convert to the percentage who received recommended care. We also omit a few studies from the averaging process because they did not report a percentage of people receiving good or bad care. (Some studies, for example, showed an association between care of a particular condition delivered by more experienced clinicians and better clinical outcomes for the condition.) Finally, when there is a range of values for a single item, we use the value that indicates highest quality.

A simple average of the findings of the preventive care studies shows that about 50 percent of people received recommended care. (None of the studies reported a percentage of people receiving contraindicated preventive care.) An average of 70 percent of patients received recommended acute care, and 30 percent received contraindicated acute care. For chronic conditions, 60 percent received recommended care and 20 percent received contraindicated care. These values do not indicate exact levels of quality in the United States, but they do provide a quantitative sense of how much could be done in all areas to identify and eliminate overuse and underuse of care. To provide more precise percentages, we would need to take into account the methodologies of the studies, the sample sizes, the prevalence of conditions, and the impact each type of care has in promoting health.

A few examples emphasize this point. An annual influenza vaccine is recommended as a preventive measure for all adults 65 years or older, a group at especially high risk for complications and death from influenza (U.S. Preventive Services Task Force 1989, 1996). However, in 1993, 52 percent of people in this age group in the United States received the vaccine; among people who had been to the doctor at least once that year, the percentage was slightly higher at 56 percent (Centers for Disease Control and Prevention [CDC] 1995b).

A major issue in acute care is the overuse of antibiotics, which has led to the development of strains of bacteria that are resistant to available antibiotics (Begley 1994; Centers for Disease Control and Prevention 1994a). Antibiotics are almost never an appropriate treatment for people with a common cold because almost all colds are caused by a virus, for which antibiotics are not effective. However, in a study of Medicaid beneficiaries diagnosed with a cold in Kentucky during a one-year period from 1993 to 1994, 60 percent filled a prescription for an antibiotic (Mainous et al. 1996).

Other types of medications are also not always used in the most appropriate manner. Among hospitalized elderly patients with depression who were discharged on antidepressant medication, 33 percent were on a dose below the recommended level (Wells et al. 1994b). In a study of 634 patients with depression or depressive symptoms in Boston, Chicago, and Los Angeles, 19 percent were treated with minor tranquilizers and no antidepressants (Wells et al. 1994a), despite the lack of evidence that tranquilizers work for depression and the risk that they will cause side effects or addiction (Depression Guideline Panel 1993).

Patients with chronic conditions, for which certain routine examinations and tests are crucial in order to prevent complications, do not all get the care they need. Diabetes mellitus causes several complications that are less likely to occur with good care. One complication is an eye condition called diabetic retinopathy, which is the leading cause of new blindness among persons aged 20 to 74 in the United States. It is recommended that patients with insulin-dependent diabetes mellitus have an annual dilated eye examination (the clinician uses drops to enlarge the pupil to see behind it more easily) starting five years after diagnosis and that patients with non-insulin-dependent diabetes mellitus have the exam annually starting at the time of diagnosis. In a national study in 1989, 49 percent of adults with either type of diabetes had undergone a dilated eye examination in the past year (66 percent in the past two years), and 61 percent had undergone any type of eye exam in the past year (79 percent in the past two years). Twenty percent of diabetics had no eye exam in the past two years. Among diabetics who were at particularly high risk for vision loss because they already had retinopathy or because they had had diabetes for a long time, 61 percent and 57 percent, respectively, had a dilated examination in the past year (Brechtner et al. 1993).

Sometimes surgery is performed on people who do not need it. A study of seven managed care organizations revealed that about 16 percent of hysterectomies performed during a one-year period from 1989 to 1990 were carried out for inappropriate reasons. An additional 25 percent were done for reasons of uncertain clinical benefit (Bernstein et al. 1993b). There are also examples of patients who need surgery but do not receive it. In a study of four hospitals, 43 percent of patients with a positive exercise stress test demonstrating the need for coronary angiography had received it within 3 months; 56 percent had received it within 12 months (Laouri et al. 1997).

Adverse events are injuries caused by medical management of a disease rather than by the disease itself. A review in New York State in 1984 found that 1.0 percent of hospitalizations had an adverse event due to negligence (Brennan et al. 1991). A study of two Boston hospitals found an adjusted rate of preventable adverse drug events of 1.8 per 100 hospital admissions; 20 percent of these events were life-threatening (Bates et al. 1995).

Not all studies have found such poor quality. In a study of patients who had cataract surgery, 2 percent had the surgery for inappropriate reasons (Tobacman et al. 1996). In a study of patients who underwent coronary artery bypass graft (CABG) surgery, 1.6 percent had surgery for inappropriate reasons (Leape et al. 1996). Nonetheless, the majority of studies described in the tables show much room for improvement of quality.

Many have been quick to conclude that managed care is responsible for much of the poor quality that is found in the American health care system. Studies published in the research literature have neither clearly confirmed nor refuted this conclusion. Some studies find that managed care organizations provide better care than fee-for-service (FFS), some find that FFS provides better care, and others find that the care is about the same (Miller and Luft 1993, 1994). Results vary depending on the setting, the type of care assessed, and the methodology. This topic is complicated by the research approach, which has generally lumped together managed care organizations without distinguishing them either by type (e.g., group- and staff-model health maintenance organizations, independent practice associations, preferred provider organizations, point-of-service plans) or by features (e.g., comprehensiveness of the benefits package, nonprofit versus for-profit status). It would be more useful to look at the impact of specific characteristics of managed care organizations. For example, inclusion of immunizations in the benefits

package may have a larger impact on immunization rates than whether the care is offered by a managed care organization or a fee-for-service provider. Finally, managed care is changing so rapidly (Landon et al. 1998) that most currently available studies are already out of date. Our ongoing quality measurement system is not large enough to enable timely assessment of the rapid changes occurring in the health care marketplace. Even the most widely used systems (e.g., the Health Plan Employer Data and Information Set, described below) are far from universal and do not cover both managed care and fee-for-service.

In this article, we have described reports of quality that have appeared in the research literature. There are also some systems that measure quality in select sectors of the United States, most notably the National Committee for Quality Assurance's (NCQA) Health Plan Employer Data and Information Set (HEDIS). HEDIS is a performance measurement tool designed to assist purchasers and consumers in evaluating managed care plans and to hold plans accountable for the quality of their services. In 1996, more than 330 plans—over half the U.S. plans representing more than three-quarters of all commercial managed care enrollees—were reporting HEDIS measures on their commercial enrollees. Average adherence rates for select indicators made publicly available by NCQA fell primarily in the 60 to 70 percent range, with the extremes at 38 percent for diabetic eye exams (past year) and 84 percent for initiation of prenatal care in the first trimester (Thompson et al. 1998). Thus, HEDIS's findings are consistent with those of the studies we have reported. Whether assessing quality as part of a research study or as part of a marketplace tool, the evidence repeatedly shows that quality falls short of standards.

Although NCQA, other organizations, and government bodies are doing work to measure quality of care, most of this activity has begun during the past decade. The rapid development of the field is encouraging, but it is confined to organizations that cover specific sections of the country or restrict themselves to certain segments of the health care marketplace. Their work, as well as the findings of individual studies, such as those listed in the tables, provide some evidence of the situation throughout the country. However, there is no system in the United States to provide a comprehensive assessment of quality of care for the nation—including how quality varies by population subgroups (e.g., gender, age, race/ethnicity, income, region of country, size of community) and how quality is changing over time. Efforts like HEDIS could eventually lead to development of a more comprehensive, national quality assessment

system, but such a system may not develop rapidly unless there is an organized effort to ensure that it does.

Conclusions

The quality of health care provided in the United States varies among hospitals, cities, and states. Whether the care is preventive, acute, or chronic, it frequently does not meet professional standards. We can do much better. The solution is not simply a matter of spending more money on health care. A large part of our quality problem is the amount of inappropriate care provided in this country. Elimination of such non-beneficial and potentially harmful care would lead to a large savings in human and financial costs. However, there are also many examples of people who receive either too little or technically poor care; fixing these problems may increase expenditures.

Some have assumed that all care delivered in the United States is outstanding. There is good reason to be proud of our health care system, and the evidence from international studies does not show consistent superiority elsewhere in the world (Gray et al. 1990; Pilpel et al. 1992; McGlynn et al. 1994; Froehlich et al. 1997; Meijler et al. 1997; Tamblyn et al. 1997; Wong et al. 1997). The United States is responsible for many important advances in health care technology, and state-of-the-art care is available in both large and small communities throughout the country. Just because outstanding care is available, however, does not mean that it is always provided or that everyone has access to such care. Most people in the studies reported here did receive excellent care—what is notable is that many also did not.

Some people might conclude that quality is good enough based on the evidence we have presented in this article—in other words, that the standards used in the various studies are too high. We would disagree with such a conclusion.

For those who want to improve our health care system, techniques exist to measure and change the delivery of care. Clinicians and health plans can use information on quality to determine where to focus their efforts to provide better care. If this information is made available regularly and in an interpretable form, consumers and large purchasers can also use it to make informed decisions when choosing among clinicians and plans, which will, in turn, give providers an added incentive to improve quality.

Policy makers can also use information about quality of care to determine the impact of public and private changes in the health care marketplace. We are currently experiencing a dramatic shift in the organization and financing of health services delivery in the United States. The private sector has been the driving force behind this transformation, but the public sector is beginning to use its market power as well. Incentives to move Medicaid and Medicare beneficiaries into managed care represent one of many examples of public sector reform. Changes are occurring faster than evaluations of these changes can be performed. Much of the information concerning the relation between the organization of the health care system and the quality of care is already outdated. At present, we have only a patchwork of systems that measure quality, with little uniformity, breadth, or ability to produce rapid results. Furthermore, these systems do not yet assess most providers of health care in the United States.

The United States cannot afford to let this situation continue. A systematic strategy for routine monitoring and reporting on quality, as well as the information systems needed to support such activities, will be essential if we are to preserve the best of the American health care system while striving to improve the efficiency with which high-quality services are provided.

This strategy could be organized by the federal government, the private sector, or a public-private partnership. It could involve coordination among all three. Regardless, the strategy will need to cover the aspects of quality that patients, purchasers, and providers care about; it will need to collect data in a way that is manageable, reasonable, and affordable; and it will need to produce information in a format that is useful for making a variety of decisions.

The United States is capable of setting up a quality measurement system that can provide the multiple participants in the health care system with the information they need to ensure delivery of high-quality care. In light of the changes that the health care system has been experiencing, a strategy to measure and consequently to improve quality is needed now.

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Acknowledgments: Partial funding was provided by the National Coalition on Health Care. We are indebted to Allison L. Diamant, MD, MSPH, Molla Donaldson, PhD, Rachel Spilka, PhD, and Joseph H. Triebwasser, MD, for comments on drafts of this paper. We are also indebted to Lauren N. Nguyen, MPH, Cung B. Pham, Yuko Sano, and Sinaroth Sor, MD, for research assistance.